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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/894,125	06/29/2001	Shunpei Yamazaki	740756-2330	7248

31780 7590 06/02/2005

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EXAMINER	
KEBEDE, BROOK	
ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/894,125	YAMAZAKI ET AL.	
	Examiner	Art Unit	
	Brook Kebede	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,19-30 and 47-58* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,19-30 and 47-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/352,198.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 18, 2005 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claim 47, 48, and 53-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Morosawa (JP/07038113).**

Re claim 47, 53, 55, and 57, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon (2 3) over a substrate (see Drawing 1, Examples and Abstract); irradiating the semiconductor film with laser light in an atmosphere containing oxygen for crystallizing said semiconductor film (see Examples Paragraph 0009); removing a natural oxidation film (8) formed on a surface of the semiconductor film by etching (i.e., dipping in 1% HF solution) after the first irradiation of the laser light and before the second radiation anneal treatment; and leveling the surface of the semiconductor film by heating in the atmosphere containing inert gas in reducing atmosphere

(i.e., in treating the film with NH_3 and N_2 plasma ; see page 6/10 and lines 5-17 of the English translation that was submitted by Applicants on April 18, 2005) after removing the natural oxidation film (see the English translation that was submitted by Applicants on April 18, 2005).

Re claim 48, 54, 56, and 58, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating the semiconductor film with laser light in an atmosphere containing oxygen for crystallizing the semiconductor film; treating a surface of the semiconductor film with a hydrofluoric acid to remove a natural oxidation film formed on the surface of the semiconductor film after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating in inert gate (i.e., nitrogen gas) or in reducing atmosphere (i.e., in hydrogen) after the treatment with the hydrofluoric acid i.e., dipping in 1% HF solution) before the second radiation anneal treatment (see the English translation that was submitted by Applicants on April 18, 2005).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 19, 20, 23-30, 51 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morosawa (JP/07038113).**

Re claim 19, 25, 27 and 29, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light in an atmosphere containing oxygen for crystallizing said semiconductor film; removing an oxide film formed on a surface of the semiconductor film by etching with buffered HF (i.e., 1% HF) after the first irradiation of the laser light and before the second laser light irradiation; and leveling the surface of the semiconductor film by heating in an atmosphere containing in inert gas or oxygen or the combination of after removing the oxide film, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation that was submitted by Applicants on April 18, 2005).

However, Morosawa is silent about the concentration of oxygen or oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claims 20, 26, 28, and 30, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating the semiconductor film with laser light in an atmosphere containing oxygen for crystallizing said semiconductor film; treating a surface of the semiconductor film with a buffered hydrofluoric acid (i.e., 1% HF) after the first irradiation of the laser light before

the second irradiation of light; and leveling the surface of the semiconductor film by heating after the treatment with the hydrofluoric acid in an atmosphere, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation that was submitted by Applicants on April 18, 2005).

However, Morosawa is silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure

of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 23, as applied to claim 19 above, Morosawa discloses all the claimed limitations including leveling (i.e., annealing) the semiconductor film at temperature between 500 and 600 °C (i.e., outside the claimed temperature range of 900 and 1200 °C) (see the English translation that was submitted by Applicants on April 18, 2005).

One of ordinary skill in the art would have been motivated to optimize the claimed annealing temperature range by using routine experimentation in order to achieve the desired device performance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to optimize the claimed annealing temperature range, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed temperature range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the

Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 24, as applied to claim 20 above, Morosawa discloses all the claimed limitations including leveling (i.e., annealing) the semiconductor film at temperature between 500 and 600 °C (i.e., outside the claimed temperature range of 900 and 1200 °C) (see the English translation that was submitted by Applicants on April 18, 2005).

One of ordinary skill in the art would have been motivated to optimize the claimed annealing temperature range by using routine experimentation in order to achieve the desired device performance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to optimize the claimed annealing temperature range, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed temperature range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 51, as applied to claim 47 in Paragraph 3 above, Morosawa discloses all the claimed limitations including leveling (i.e., annealing) the semiconductor film at temperature between 500 and 600 °C (i.e., outside the claimed temperature range of 900 and 1200 °C) (see the English translation Examples in Paragraph 0010).

One of ordinary skill in the art would have been motivated to optimize the claimed annealing temperature range by using routine experimentation in order to achieve the desired device performance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to optimize the claimed annealing temperature range, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed temperature range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 52, as applied to claim 47 in Paragraph 3 above, Morosawa discloses all the claimed limitations including leveling (i.e., annealing) the semiconductor film at temperature

between 500 and 600 °C (i.e., outside the claimed temperature range of 900 and 1200 °C) (see the English translation that was submitted by Applicants on April 18, 2005).

One of ordinary skill in the art would have been motivated to optimize the claimed annealing temperature range by using routine experimentation in order to achieve the desired device performance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to optimize the claimed annealing temperature range, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed temperature range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

6. Claims 21, 22, 49, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morosawa (JP/07038113) in view of Yamazaki et al. (US/5,608,232).

Re claim 21, as applied to claim 19 in Paragraph 5 above, Morosawa discloses all the claimed limitations including annealing of the substrate during the leveling step.

However, Morosawa does not specifically disclose furnace annealing.

Yamazaki et al. disclose furnace annealing of the substrate in nitrogen atmosphere in order to crystallize the semiconductor layer (see Yamazaki et al. Col. 24, lines 10-30).

Both Morosawa and Yamazaki et al. teachings are directed to fabricating of TFTs the process includes depositing of semiconductor thin film and annealing the semiconductor thin film the crystallize the thin film. Therefore, the teachings of Morosawa and Yamazaki et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with furnace annealing during leveling process of the semiconductor layer as taught by Yamazaki et al. in order to crystallize the semiconductor layer.

Re claim 22, as applied to claim 20 in Paragraph 5 above, Morosawa discloses all the claimed limitations including annealing of the substrate during the leveling step.

However, Morosawa does not specifically disclose furnace annealing.

Yamazaki et al. disclose furnace annealing of the substrate in nitrogen atmosphere in order to crystallize the semiconductor layer (see Yamazaki et al. Col. 24, lines 10-30).

Both Morosawa and Yamazaki et al. teachings are directed to fabricating of TFTs the process includes depositing of semiconductor thin film and annealing the semiconductor thin film the crystallize the thin film. Therefore, the teachings of Morosawa and Yamazaki et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with furnace

annealing during leveling process of the semiconductor layer as taught by Yamazaki et al. in order to crystallize the semiconductor layer.

Re claim 49, as applied to claim 47 in Paragraph 3 above, Morosawa discloses all the claimed limitations including annealing of the substrate during the leveling step.

However, Morosawa does not specifically disclose furnace annealing.

Yamazaki et al. disclose furnace annealing of the substrate in nitrogen atmosphere in order to crystallize the semiconductor layer (see Yamazaki et al. Col. 24, lines 10-30).

Both Morosawa and Yamazaki et al. teachings are directed to fabricating of TFTs the process includes depositing of semiconductor thin film and annealing the semiconductor thin film the crystallize the thin film. Therefore, the teachings of Morosawa and Yamazaki et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with furnace annealing during leveling process of the semiconductor layer as taught by Yamazaki et al. in order to crystallize the semiconductor layer.

Re claim 50, as applied to claim 48 in Paragraph 3 above, Morosawa discloses all the claimed limitations including annealing of the substrate during the leveling step.

However, Morosawa does not specifically disclose furnace annealing.

Yamazaki et al. disclose furnace annealing of the substrate in nitrogen atmosphere in order to crystallize the semiconductor layer (see Yamazaki et al. Col. 24, lines 10-30).

Both Morosawa and Yamazaki et al. teachings are directed to fabricating of TFTs the process includes depositing of semiconductor thin film and annealing the semiconductor thin

film the crystallize the thin film. Therefore, the teachings of Morosawa and Yamazaki et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with furnace annealing during leveling process of the semiconductor layer as taught by Yamazaki et al. in order to crystallize the semiconductor layer.

7. **Claims 1-12, 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morosawa (JP/07038113) in view of Kudo et al. (JP/09186336).**

Re claim 1, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon (2 or 3) (see Drawing 1 and Examples and Abstract) over a substrate (1); irradiating the semiconductor film with laser light for crystallizing the semiconductor film (see Examples Paragraph 0009); removing a natural oxidation film (8) (see Drawing 7 and 8; Examples, Paragraph 0010) formed on a surface of the semiconductor film by etching after the irradiation of the laser light (i.e., by dipping in HF); and leveling the surface of the semiconductor film by heating after removing the natural oxidation film (see the English translation that was submitted by Applicants on April 18, 2005).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to

dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

Re claims 2, 16, and 17, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light for crystallizing the semiconductor film; removing an oxide film formed on a surface of the semiconductor film by etching (i.e., treating) the surface with buffered HF (i.e., 1% HF) after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating in a reducing atmosphere containing hydrogen after removing the oxide film (see the English translation Example in Paragraph 0007 through Paragraph 00016).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the

amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

Re claims 3 and 15, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating the semiconductor film with laser light for crystallizing said semiconductor film; removing an oxide film formed on a surface of the semiconductor film by etching after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating in an inert gas (i.e., nitrogen) after removing said oxide film (see the English translation that was submitted by Applicants on April 18, 2005).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the

amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

Re claim 4, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light for crystallizing said semiconductor film; removing an oxide film formed on a surface of the semiconductor film by etching after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating in an atmosphere after removing the oxide film, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation that was submitted by Applicants on April 18, 2005).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air and the concentration of oxygen or oxygen compound being 10 ppm or less.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

However, both Morosawa and Kudo et al. are silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in

order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 5, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light in air for crystallizing said semiconductor film; removing an oxide film formed on a surface of the semiconductor film by etching after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating in a reducing atmosphere after removing said oxide film, a concentration of oxygen or an oxygen compound contained in said reducing atmosphere, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation that was submitted by Applicants on April 18, 2005).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air and the concentration of oxygen or oxygen compound being 10 ppm or less.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

However, both Morosawa and Kudo et al. are silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 6, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light for crystallizing said semiconductor film; removing an oxide film formed on a surface of the semiconductor film by etching after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating in an

inert gas after removing said oxide film, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation that was submitted by Applicants on April 18, 2005).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air and the concentration of oxygen or oxygen compound being 10 ppm or less.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

However, both Morosawa and Kudo et al. are silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be

set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 7, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light for crystallizing the semiconductor film;

treating a surface of the semiconductor film with a hydrofluoric acid to remove a natural oxidation film formed on the surface of the semiconductor film after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after the treatment with the hydrofluoric acid (see the English translation Example in Paragraph 0007 through Paragraph 00016).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

Re claim 8, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate;

irradiating the semiconductor film with laser light for crystallizing the semiconductor film; treating a surface of the semiconductor film with a hydrofluoric acid after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after the treatment with the hydrofluoric acid in a reducing atmosphere (see the English translation Example in Paragraph 0007 through Paragraph 00016).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

Re claim 9, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate;

irradiating the semiconductor film with laser light for crystallizing said semiconductor film; treating a surface of the semiconductor film with a hydrofluoric acid after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after the treatment with the hydrofluoric acid in an inert gas (see the English translation Example in Paragraph 0007 through Paragraph 00016).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

Re claim 10, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate;

irradiating said semiconductor film with laser light for crystallizing said semiconductor film; treating a surface of the semiconductor film with a hydrofluoric acid after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after the treatment with said hydrofluoric acid in an atmosphere, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation Example in Paragraph 0007 through Paragraph 00011).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air and the concentration of oxygen or oxygen compound being 10 ppm or less.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

However, both Morosawa and Kudo et al. are silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 11, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating said semiconductor film with laser light for crystallizing said semiconductor film; treating a surface of the semiconductor film with a hydrofluoric acid after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after the treatment with said hydrofluoric acid in a reducing atmosphere, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation Example in Paragraph 0007 through Paragraph 00011).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air and the concentration of oxygen or oxygen compound being 10 ppm or less.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on

the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

However, both Morosawa and Kudo et al. are silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon

another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 12, Morosawa discloses a method of manufacturing a semiconductor device comprising the steps of: forming a semiconductor film comprising silicon over a substrate; irradiating the semiconductor film with laser light for crystallizing said semiconductor film; treating a surface of the semiconductor film with a hydrofluoric acid after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after the treatment with the hydrofluoric acid in an inert gas, in an atmosphere containing predetermined concentration of oxygen or an oxygen compound (see the English translation Example in Paragraph 0007 through Paragraph 00011).

Although Morosawa discloses irradiating said semiconductor film (i.e., an amorphous silicon film) with a leaser light for crystallizing the semiconductor film, Morosawa is silent about irradiating the semiconductor film with leaser light in air and the concentration of oxygen or oxygen compound being 10 ppm or less.

Kudo et al. disclose method of manufacturing thin film transistor the method includes depositing an amorphous silicon film (25) (i.e., a semiconductor layer) and irradiating the amorphous silicon film (25) with an excimer laser in atmosphere containing an air in order to dehydrogenate the amorphous silicon film and change into polysilicon thin film (see Abstract and Drawing 2).

Both Morosawa and Kudo et al. teachings directed to irradiating amorphous thin film layer using laser light to crystallize the thin film after the thin film deposited for fabrication of TFTs. Therefore, the teachings of Morosawa and Kudo et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa reference with irradiating on the semiconductor film (i.e., amorphous silicon film) in air as taught by Kudo et al. in order to dehydrogenate the amorphous silicon film and convert it to polysilicon thin film.

However, both Morosawa and Kudo et al. are silent about the concentration of oxygen of oxygen compound being 10 ppm or less during the leveling step. Although the concentration is not specifically disclosed by Morosawa and Kudo et al., such oxygen concentration rage can be set within the level ordinary skill in the art by routine optimization to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

One of ordinary skill in would have motivated to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to set the oxygen concentration at 10 ppm or less by routine optimization in order to passivate the damaged surface of the semiconductor layer during removal of natural (native) oxide, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure

of either the critical nature of the claimed concentration range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 14, as applied to claims 1-12 above, both Morosawa and Kudo et al. in combination discloses all the claimed limitations including leveling (i.e., annealing) the semiconductor film at temperature between 500 and 600 °C (i.e., outside the claimed temperature range of 900 and 1200 °C) (see the English translation Examples in Paragraph 0010).

One of ordinary skill in the art would have been motivated to optimize the claimed annealing temperature range by using routine experimentation in order to achieve the desired device performance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to optimize the claimed annealing temperature range, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed temperature range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the

Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morosawa (JP/07038113) in view of Kudo et al. (JP/09186336), as applied in claims 1-12 and 15-17 in Paragraph 7 above, and further in view of Yamazaki et al. (US/5,608,232).

Re claim 13, as applied to claims 1-12 in Paragraph 7 above, Morosawa and Kudo et al. in combination disclose all the claimed limitations including annealing of the substrate during the leveling step.

However, both Morosawa and Kudo et al. do not specifically disclose furnace annealing.

Yamazaki et al. disclose furnace annealing of the substrate in nitrogen atmosphere in order to crystallize the semiconductor layer (see Yamazaki et al. Col. 24, lines 10-30).

Morosawa, Kudo et al., and Yamazaki et al. teachings are directed to fabricating of TFTs the process includes depositing of semiconductor thin film and annealing the semiconductor thin film the crystallize the thin film. Therefore, the teachings of Morosawa, Kudo et al., and Yamazaki et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Morosawa and Kudo et al., reference with furnace annealing during leveling process of the semiconductor layer as taught by Yamazaki et al. in order to crystallize the semiconductor layer.

Response to Arguments

9. Applicants' arguments filed on September 27, 2004 have been fully considered but they are not persuasive.

Applicants argued that "Morosawa JP 07-038113 does not teach leveling of surface of the semiconductor film by heating after removing said the natural oxide film," as recited in the independent claims.

It is respectfully submitted that, based on the full English translation of Morosawa JP 07-038113 patent which is submitted by Applicants on April 18, 2005, Morosawa teaches leveling of the semiconductor layer (i.e., the polysilicon layer 6) after the removal process of "natural oxide" (i.e., native oxide) layer.

For practical purpose, it is respectfully submitted that a portion taken from the full translation of Morosawa JP 07-038113 patent is set forth below. (See also page 6/10 and lines 5-17 of the English translation that was submitted by Applicants on April 18, 2005).

> **gate insulating film 9 which is formed of a silicon oxide film and a silicon nitride film is formed over whole surface of the substrate. That is, the silicon oxide film is first deposited over whole surface of the substrate by sputtering, and subsequently, the silicon nitride film is deposited by plasma CVD using the mixed gas including SiH_4, NH_3, and N_2 on the surface of the silicon oxide film. When the silicon nitride film is deposited by plasma CVD, a temperature of the glass substrate 1 is set at approximately 250 °C, SiH_4 is set at approximately 30 SCCM, NH_3 is set at approximately 60 SCCM, N_2 is set at approximately 390 SCCM and it carries out in output power set at approximately 600 W and a pressure set at approximately 0.5 Torr in order to hydrogenate the poly-silicon thin film 6 at the same time and to reduce dangling bonds thereof. Thus, the gate insulating film 9 is deposited by plasma CVD over the poly-silicon thin film 6 and at the same time, the poly-silicon thin film 6 is hydrogenated to decrease the dangling bonds thereof. Therefore, deposition of the gate insulating film 9 and hydrogenation of the poly-silicon thin film 6 can be performed by one-time plasma CVD at the same time. Consequently, a process only for hydrogenation can be omitted, as a result, the number of manufacturing processes can be lessened. Next, a gate electrode 10 including Cr is formed at the top face of the**

As shown above, the polysilicon layer **6** treated with ammonia and nitrogen plasma in order to remove the dangling bonds in the polysilicon film **6**. This process occurs in conjunction of with the process of depositing of insulating layer which the process also requires heating of the substrate at 250 °C.

As clearly shown above, it is respectfully submitted that Morosawa teaches all the claimed limitations of claims 47, 48 and 53-58. Furthermore, a prior art reference must be considered in its entirety. See *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984). Furthermore, claims are given their broadest reasonable interpretation in light of the supporting disclosure. See *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969). See also *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

Therefore, the rejection under 35 U.S.C. 102 is deemed proper.

Furthermore, the *prima facie* case of obviousness has been met and the rejection under 35 U.S.C. § 103 is deemed proper.

Conclusion

10. **THIS ACTION IS MADE NON-FINAL.**

Correspondence

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brook Kebede whose telephone number is (571) 272-1862. The examiner can normally be reached on 8-5 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Brook Kebede

Brook Kebede
Examiner
Art Unit 2823

BK
May 31, 2005